

A bumper beam for a vehicle

Technical area

This invention relates to a bumper beam for a vehicle, comprising an outer profile with a bow-formed central flange and two webs and a cover that provides a closed profile, the outer profile being adapted to be fastened with its central flange facing outwards from the vehicle.

Background of the invention

A bumper beam that has good properties for various kinds of barrier crashes may be bad for a collision with a pole at a low velocity. One of the most common accidents involving a rear bumper beam, for example, is the crash against a lamp post on a parking lot. In particular when the bumper beam is fastened in crash boxes that are weak sideways, the bumper beam will collapse locally and fold.

Object of invention

It is an object of the invention to provide a bumper beam that has good performance generally and also good performance in a low velocity crash against a pole. This is achieved when the cover has a central flange and two webs, and the webs of the cover are coupled in pairs with the webs of the outer profile, the web height of the cover at its centre being greater than the web height of the outer profile at its centre.

Brief description of the drawings

Figure 1 is a top view of a bumper beam.
Figure 2 is a side view of the same bumper beam as seen from inside the vehicle.
Figure 3 is a section taken along line 3-3 in figure 1.
Figure 4 is an enlargement of a portion of figure 1.
Figure 5 is a perspective view of one of the parts that make up the bumper beam of the preceding figures.

Description of the illustrated and preferred example of the invention.

Figure 1 shows, as seen from above, a bumper beam 11 of steel symmetrically fastened in two crash boxes 13, only one of which being illustrated and only schematically. The bumper beam is made up of an outer profile in the form of a bow-formed beam 14 and a cover 15. The outer profile is a hat profile as shown in **figure 3** with a central flange 16 and two webs 17,18 that end in side flanges 19,20. The central portion of the central flange may have a longitudinal stiffener 21, the depth of which decreases from its centre so that it ends at 22. The cover 15 is also in the form of a hat profile with a central flange 24 and two webs 25,26 that end in side flanges 27,28. The webs of the two hat beams are united by welds. The webs can be directly welded together or alternatively, they can be united by having their side flanges 19,20; 27,28 welded together as illustrated. As can be seen in figure 3, the sheet thickness of the cover is less than the sheet thickness of the outer profile. The steel of the cover may also have lower yield strength than the steel of the outer profile. The outer profile can suitably be press-hardened, that is, hot stamped and hardened in the same tools in one operation, whereas the cover can suitably be cold formed from cold-forming sheet steel. The outer profile may have a sheet thickness of 2 mm and a yield strength of about 1150 MPa or more, whereas the cover may have a considerably less sheet thickness and a yield strength of less than ¾ of the yield strength of the outer profile, for example

about half the strength. The sheet thickness of the cover may suitably be at most ¾ of the thickness of the outer profile.

The cover 15, that is, the inner profile, is shown in perspective as **figure 5**. Its webs 25,26 has transverse stiffeners 23 and the height of the webs reduces continuously so that the cover ends a flat sheet.

As best shown in **figure** 4, the crash boxes 13 have a fastening plate 29 with holes for screws so that they can be screwed to a supporting portion of the vehicle. They have a fastening plate 30 as well in which the outer profile is fastened, preferably being welded thereto. The plate 30 has a portion 31, which is bent outwards and under which the flat end of the cover extends and is welded to the portion 31 so that tension forces can be transmitted between the plate 30 and the cover. Alternatively, the cover may extend under the entire plate 30 and be welded both to the plate and to the outer profile. In both cases, the outer profile 14 is fastened in the crash boxes, either directly or indirectly with the cover inbetween. Since the cover may be made of comparatively thin sheet, its fastening to the crash boxes may be too weak in the absence of the plate 30 and such a plate 30 is therefore preferred.

The central flange 24 of the cover has linear extension between the crash boxes and the depth of the bumper beam at its middle is larger than its depth at its fastening portions. The depth relation should be at least 130% or rather at least 160%. The central flange 24 of the cover takes the tension load when the outer profile hits for example a post and it reduces the risk of local collapsing of the outer profile 14. Instead of collapsing, the bumper beam will have a dent. If the tension load would not be taken up, the outer profile 14 would tend to straighten out and bend the crash boxes outwards. At high a collision load, the crash boxes would bend outwards from each other and then, they could not deform as intended and could therefore not take up energy as intended. The central flange of the cover need not be exactly linear in order to take up tension load well. It should, however, be substantially linear, and a bow form with a pitch of a few cm has a minor effect on the capability of taking up tension load.

The depth of the outer profile increases continuously from the centre of the bumper beam towards the fastening portions, which provides for a weight reduction and a cost reduction since, without disadvantage, the cover can have a thinner sheet thickness and a lower strength than the outer profile. The strength of the cover calculated as a combination of yield strength of the material and the sheet thickness may be less than half the corresponding strength of the outer profile. The stiffeners 23 or corrugation of the webs 25,25 of the cover reduces the risk of the webs collapsing.